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(58) Field of search  
F2K

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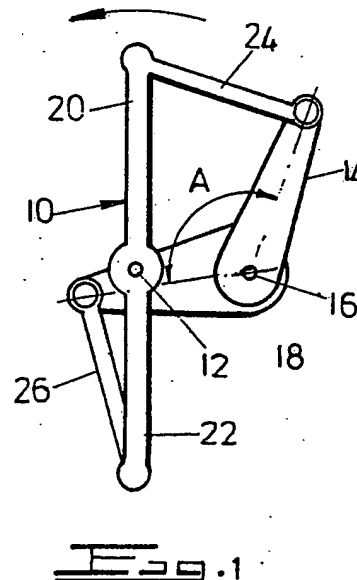
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(54) Mechanism for Converting  
Rotary Motion into Cyclically  
Variable Rotary Motion or Vice  
Versa

(57) Apparatus is disclosed comprising one or two cranks 20, 22 mounted for rotation about a first axis 12 and connected by connecting rods 24, 26 to two cranks 14, 18 mounted for rotation about a second axis 16 parallel to but spaced from the first axis 12. Rotation of the first crank or

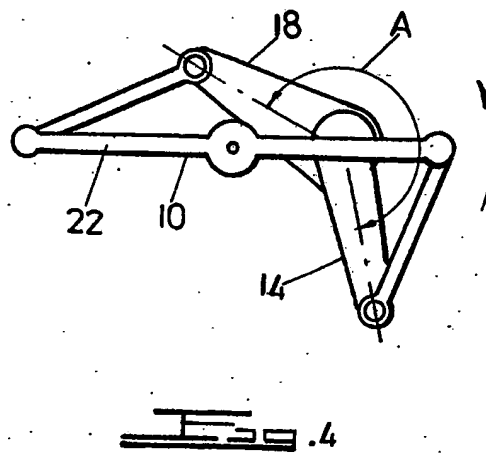
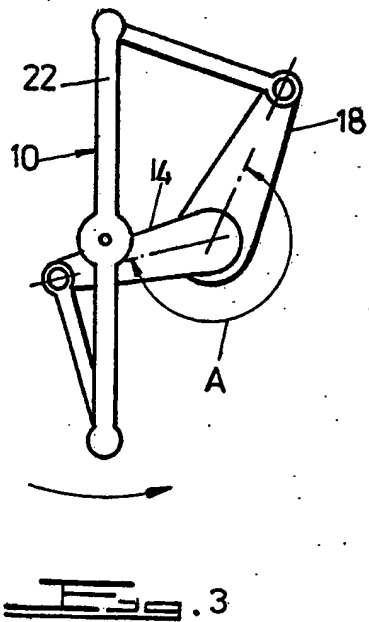
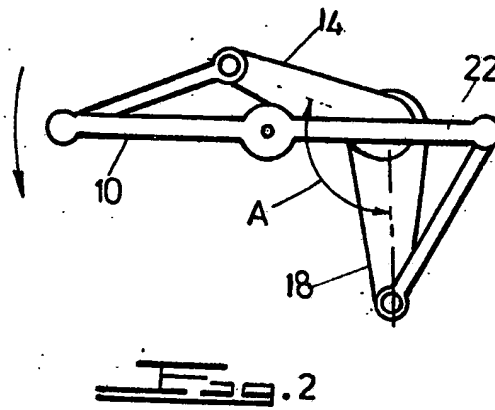
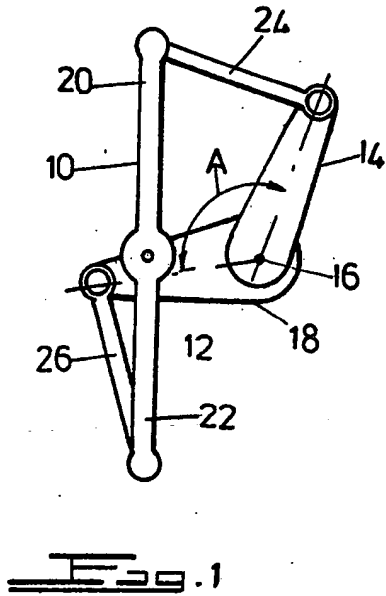
cranks 20, 22 will cause the second cranks 14, 18 to rotate with relative angular speeds which vary cyclically, the variation depending on the pitch of the two axes 12, 16 and the throw of all of the cranks. The second cranks 14, 18 can be connected for example to rotating or reciprocating parts of a mechanism whose motion is interdependent and where the cyclic variation is useful to cause the parts to move rapidly in one phase of the cycle and more slowly in another phase of the cycle.



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# SPECIFICATION

## Mechanism for Converting Rotary Motion into Variable Reciprocating Motion or Fluctuating Rotary Motion or Vice Versa

5 This invention relates to apparatus for converting substantially constant angular speed rotary motion into variable speed reciprocating or rotary motion or vice versa.

10 There are various situations in technology where it is desirable that a member should rotate at an angular speed which is not constant but which varies cyclically. Equally there are other situations where it is desirable that a member should move in a reciprocating motion in which the speed in one direction is considerably faster than the speed in the opposite direction. The present invention is concerned with situations of this type.

20 According to the invention, there is provided apparatus including at least three crank elements arranged for rotation about at least two axes offset one from the other, each crank element arranged for rotation about one of the axes being arranged to be connected by a connecting element to a crank element arranged for rotation about another of the axes.

In one form of the invention at least two of the crank elements are arranged for rotation about one of the axes.

30 According to one aspect of the invention, the apparatus includes four crank elements, two being arranged for rotation about one of the axes and two being arranged for rotation about another of the axes.

35 According to a further aspect of the invention, means is provided for varying the distance by which the one axis is off set from the other.

40 An embodiment of the invention is discussed with reference to the accompanying drawings in which Figures 1 to 4 are schematic illustrations of a mechanism in successive positions of a rotational cycle.

45 In the drawings there is shown a mechanism including a rotor or disc 10 comprising two cranks 20 and 22 mounted for rotation about an axis 12 which is fixed in space, the rotor 10 being shown in each successive illustration displaced in an anti-clockwise sense through 90 degrees from the position shown in the previous illustration; a third crank 14 mounted behind the rotor 10 for rotation about a second axis 16 which is fixed in space and is off set from the first axis 12; and a fourth crank 18 which is mounted for rotation also about the second axis 16.

50 The first crank 20 is rotationally displaced 180 degrees or other angle from the second crank 22. The third crank 14 is connected to the crank 20 by means of a first connecting rod 24. The fourth crank 18 is connected to the crank 22 by means of a second connecting rod 26.

60 If the rotor 10 is rotated by a suitable prime mover (not shown) at a constant angular speed, the first crank 20 will drive the third crank 14, causing it to rotate and the second crank 22 will

65 drive the fourth crank 18 also causing it to rotate.

Now the important feature of the mechanism is that, while each crank will in one cycle of the mechanism rotate through 360 degrees, the angle A between the third and fourth cranks 14 and 18 will vary in the cycle. This is a consequence of the fact that the rotational speed of the crank 14 varies during a cycle with respect to that of the crank 18. This variation can itself be altered by changing the distance by which the one axis 12 is off set from the second axis 16 and also by changing the throw of any of the cranks.

70 One way of employing the mechanism is to connect the crank 16 to a first reciprocating part of a machine and the crank 18 to a second reciprocating part of a machine. These connections can be brought about by any known means such as screws, spirals, cams, connecting rods or the like, or a combination thereof.

75 Moreover, the two cranks 16 and 18 can be connected together by means, for example, of a differential arrangement which is itself connected to a rotating or reciprocating part of a machine. In the latter case, the part could thus be arranged to move, for example, slowly in one direction, and rapidly in the opposite direction.

80 The crank 18 is mounted on a hollow shaft which is itself carried on suitable bearings. The crank 16 is mounted on an inner shaft which is received in the bore of the hollow shaft. The free ends of the shafts can thus be connected up as described above.

85 It will be clear that the apparatus can be used in the reverse sense, i.e. to change variable angular speed rotary motion into constant speed rotary motion.

90 The eccentricity can be changed over through concentricity to the opposite hand or sense, producing similar motions of the opposite attitude.

95 The invention has many applications. For example it can be applied to driving a positive displacement rotary pump, compressor or metering pump or reciprocating double piston machines.

100 The cranks 20 and 22 need not be fixed one with respect to the other but could be arranged to be separately driven in any suitable manner.

### Claims

1. Apparatus including at least three crank elements arranged for rotation about at least two axes off set one from the other, each crank element arranged for rotation about one of the axes being arranged to be connected by a connecting element to a crank element arranged for rotation about another of the axes.

2. Apparatus according to claim 1, in which at least two of the crank elements are arranged for rotation about one of the axes.

3. Apparatus according to claim 1 or claim 2, including four crank elements, two being arranged for rotation about one of the axes and two being arranged for rotation about another of the axes.

4. Apparatus according to any one of claims 1

to 3, in which means is provided for varying the distance by which the one axis is off set from the other in any direction.

5.

5. Apparatus substantially as herein described.

6. Apparatus substantially as herein described with reference to the accompanying drawing.

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